ECON 222A
Macroeconomic Theory I

The Asset Market, Money, and Prices

Lecture 14

Today's Lecture

- PS3 is due on the 18th
- Tutorial?

Today's Lecture

- The Demand for Money
- Asset Market Equilibrium
- Money Growth and Inflation

Money Demand

- M^d: is the quantity of monetary assets people want to hold in their portfolios
- How much money to hold? Trade-off among expected return, risk, and liquidity
- *Benefit*: money is the most liquid asset, and generally involves low risk
- *Cost*: it has a low return (opportunity cost)

Key Macro Variables Affecting M^d

People want to hold more money if:

- Price level rises
  - need more cash when goods have higher prices
- Real income rises
  - will carry out more transactions, hence more money are needed
- Interest rates fall
  - rate on return to other assets (like bonds) fall, means more money held
  - liquidity/return trade-off

Elasticities of Money Demand

- *Elasticity*: measures the percentage change in money demand resulting from a 1% change in a given factor (keeping everything else constant).

$$\eta_x = \frac{\Delta y}{\Delta x}\frac{x}{y} = \frac{\frac{\Delta y}{y}}{\frac{\Delta x}{x}} = \frac{\%\Delta y}{\%\Delta x} \qquad \eta_x = \frac{dy(x)}{dx}\frac{x}{y}$$

- Elasticities are useful because:

1. They give us a measure of the "reaction" of one variable when we vary another one.
2. They are "unit of measure free".

Elasticities of Money Demand

- Price elasticity of money demand (η_P):
  M^d is proportional to the price level P, $\eta_P = 1$
- Income elasticity of money demand (η_Y):
  is positive and less than 1 (0.5 to 0.8).
- Interest elasticity of money demand (η_i):
  is negative and small (-0.3).

The Money Demand Function

$$M^d = P \times L(Y, i)$$

- M^d = (aggregate) nominal money demand
- P = price level
- L = real money demand function
- Y = real income or output
- i = nominal interest rate on non-monetary assets

The Money Demand Function

$$M^d = P \times L(Y\ ,\ r + \pi^e)$$

$$(+,\quad -\quad)$$

- We can also express M^d in real terms
- Dividing both sides by P gets the Real money demand function:

$$M^d / P = L(Y\ ,\ r + \pi^e)$$

Other factors affecting M^d

- Wealth
  - an increase in wealth may increase M^d (small effect)
- Risk
  - Increased uncertainty in economy may increase M^d (US$ during crisis)
  - Erratic inflation bring increased risk to money, so decreases M^d
- Liquidity of alternative assets
  - Deregulation, competition, and innovation have given other assets more liquidity, decrease in M^d.
- Payment technologies
  - Credit cards, Debit Cards and ATMs decrease M^d

Velocity and the Quantity Theory of Money

- Velocity (*V*) measures how much money "turns over" each period, that is how many times the same dollar is spent in a time period.

$$V = \frac{\text{nominal GDP}}{\text{nominal money stock}} = \frac{PY}{M}$$

- Talking about Velocity and Milton Friedman…


HV-PQ

Velocity

- … Economists have a great sense of humor!
- If *V* rises, each dollar in the money stock *M* is being used in more transactions each period
- *V* depends on *M* measurement

The Quantity Theory of Money

- The real money demand function $L(Y, r + \pi^e)$ takes the simple form *kY:* it assumes that the real money demand is proportional to real income:

$$\frac{M^{d}}{P} = kY$$

- Assumes constant velocity, where velocity isn't affected by income or interest rates

$$V = 1 / k$$

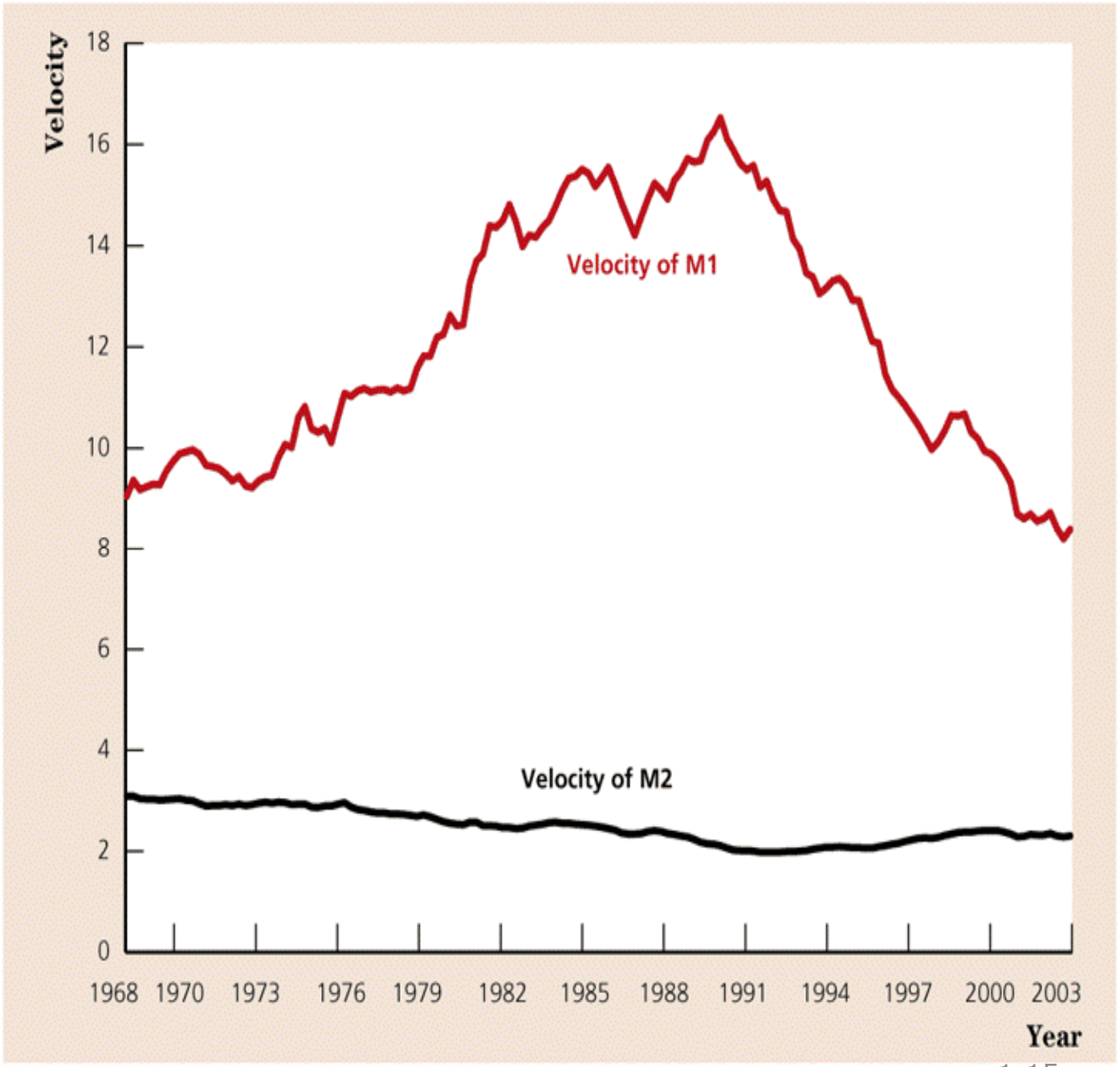
- But *M1* velocity is not constant in the data

FIGURE 7.1

VELOCITY OF M1 AND M2, 1968–2003

M1 velocity is nominal GDP divided by M1, and M2 velocity is nominal GDP divided by M2. M1 velocity rose through the 1970s, then became more erratic in the 1980s, before falling in the 1990s. M2 velocity, while declining steadily, has been more stable than M1 velocity, but it has been unpredictable over some short time periods.

Source: Statistics Canada, CANSIM II Series v37124(M1), v37128(M2), v1992221 (GDP). Series are in millions of dollars, quarterly, and seasonally adjusted.



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The Quantity Theory of Money

- Part of change in velocity due to changes in interest rates in 1980's and 90's
- Financial innovations also played a role in velocity's decline in the early 1980's
- *M2* velocity is closer to being a constant over the long run

Asset Market Equilibrium

- Demand: choice of assets in a portfolio
- Supply: quantity of assets available
- Aggregation

– There are many different types of assets

- To simplify, only two types of assets:

– Monetary (earn nominal interest i^m)

– Non-monetary (earn nominal interest i)

Asset Market Equilibrium

- Recall Money includes currency and chequing accounts

M: (1) Pays i_m (interest rate on M)

(2) Nominal Supply fixed at M

- Nonmonetary assets include stocks, bonds, real estate, etc.

NM: (1) Pays $i = r + \pi^e$ (interest rate on NM)

(2) Supply fixed at NM

Asset Market Equilibrium

- By construction, individual's hold wealth in either M or NM:
- $m^d + nm^d$ = individual's total nominal wealth
- $M^d + NM^d$ = aggregate nominal wealth
- With only two assets the equilibrium condition is reduced to a single equation:

$$M^s = M^d$$

Asset Market Equilibrium

- When $M^s = M^d$ we impose that the monetary assets are in equilibrium.
- But so are also the non-monetary assets. (By Walras' Law)
- Adding up the two markets we get:

$$M^d + NM^d = M^s + NM^s = M + NM$$

$$(M^d - M) + (NM^d - NM) = 0$$

- $(M^d - M)$ = excess demand for money
- $(NM^d - NM)$ = excess demand for nonmonetary assets
- So every time $(M^d - M) = 0$ it follows that $(NM^d - NM) = 0$ as well.
- We can focus then on the market for monetary asset.

Asset Market Equilibrium

- The above expression is nominal, we can also write it in real terms

$$\frac{M}{P} = L(Y, r + \pi^e)$$

- real money supply = real money demand

- Notice asset market equilibrium condition involves 5 variables: M, π^e, Y, r, P
- We will put this all together in Ch. 9

Asset Market Equilibrium

- Take M, π^e as given:

a. M is determined by the central bank

b. π^e is fixed (for now)

c. Labor market determines employment (N); using that in production function determines Y

d. Given Y, the goods market equilibrium condition determines r

Asset Market Equilibrium

- Re-arrange the equation above to solve for the price level (*P*):

$$P = \frac{M}{L(Y, r + \pi^e)}$$

- Price level = ratio of nominal M^s to real M^d
- Prices are proportional to nominal M^s, that is doubling the nominal M^s would double prices

Money Growth and Inflation

- Inflation is closely related to the growth rate of the (nominal) money supply.
- Rewrite the equation in growth-rates:

$$\frac{\Delta P}{P} = \frac{\Delta M}{M} - \frac{\Delta L(Y, r + \pi^e)}{L(Y, r + \pi^e)}$$

- inflation=nominal M^s growth - real M^d growth

$$\pi = \frac{\Delta M}{M} - \eta_Y \frac{\Delta Y}{Y}$$

- This equation can be used to calculate π^e

FIGURE 7.2

THE RELATIONSHIP BETWEEN MONEY GROWTH AND INFLATION

Nominal money growth and inflation during the period 1995–2001 are plotted for the European countries in transition for which complete data are available. There is a strong relationship between money growth rates and inflation rates, with countries having money growth rates in excess of 80% per year also having inflation rates in excess of 80% per year.

Source: Money growth rates and consumer price inflation from *International Financial Statistics,* February 2003, International Monetary Fund. Figure shows European countries in transition for which there are complete data.

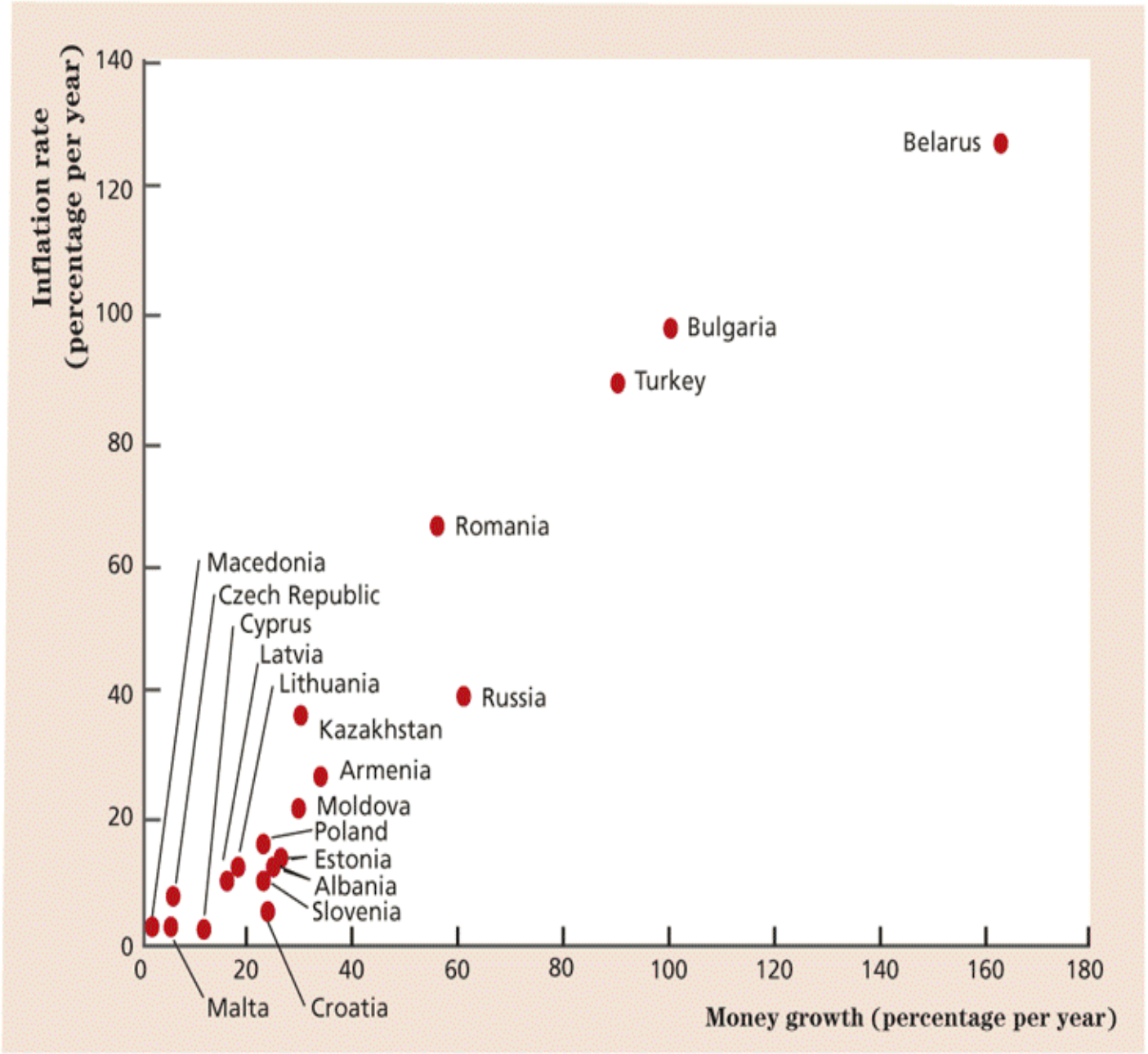

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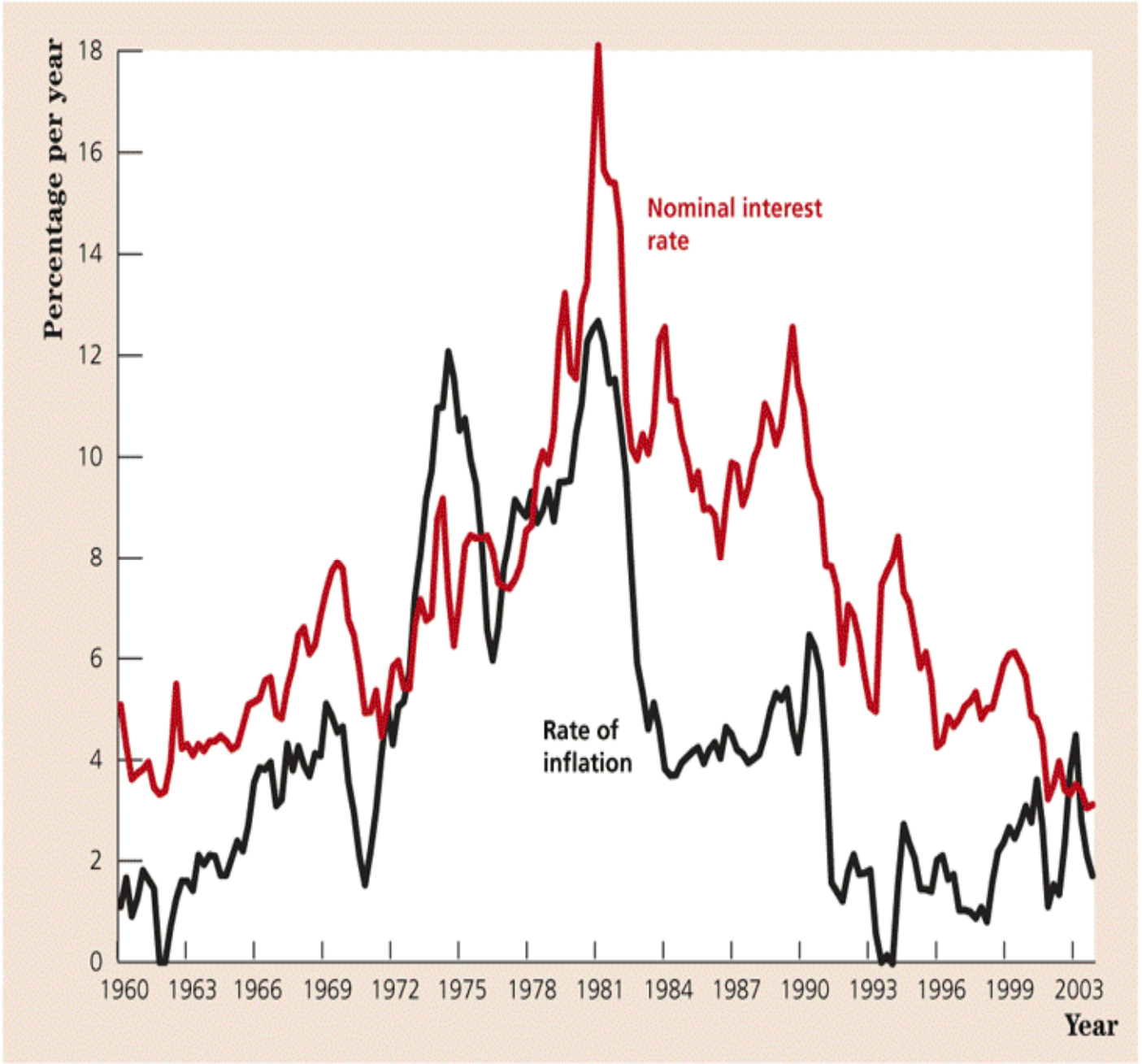
FIGURE 7.3

INFLATION AND THE NOMINAL INTEREST RATE IN CANADA, 1960–2003

The figure shows the nominal interest rate on one- to three-year federal government bonds and the annual rate of inflation as measured by the CPI. The nominal interest rate tends to move together with inflation, although there are periods, such as the early 1980s and mid-1990s, when the two variables diverge.

Source: Nominal interest rate is the annual average yield on one- to three-year Government of Canada bonds: Adapted from the Statistics Canada CANSIM database <http://cansim2.statcan.ca>, Series V122499. Inflation is the rate of change of the consumer price index: Adapted from the Statistics Canada CANSIM database <http://cansim2.statcan.ca>, Series V735319.



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Inflation Expectations

- π^e often close to current π if people don't think *M* or *Y* growth will change much
- π^e can be measured by surveys
- If *r* stable, π^e can be inferred from *i*
- Policy actions causing π^e to rise should cause *i* to rise